R&D Utilization Report 76-1

AD

IMPLEMENTING THE SKILL QUALIFICATION TESTING SYSTEM.

Milton H. Maier, Douglas L. Young, and Stephen F. Hirshfeld

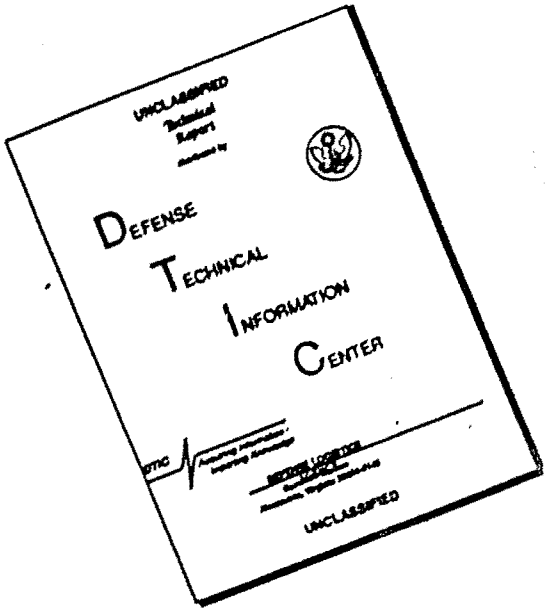
INDIVIDUAL TRAINING AND SKILL EVALUATION TECHNICAL AREA

April 1976

U. S. ARMY RESEARCH INSTITUTE
for the
BEHAVIORAL AND SOCIAL SCIENCES

DA-2-Q-763731-A-774

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

U. S. ARMY RESEARCH INSTITUTE
FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency under the Jurisdiction of the Deputy Chief of Staff for Personnel

J. E. UHLANER
Technical Director

W. C. MAUS
COL, GS
Commander

NOTICES

DISTRIBUTION: Primary distribution of this report has been made by ARI. Please address correspondence concerning distribution of reports to: U. S. Army Research Institute for the Behavioral and Social Sciences, ATTN: PERI-P, 1300 Wilson Boulevard, Arlington, Virginia 22209.

FINAL DISPOSITION: This report may be destroyed when it is no longer needed. Please do not return it to the U. S. Army Research Institute for the Behavioral and Social Sciences.

NOTE: The findings in this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1 REPORT NUMBER: R&D Utilization Report 76-1	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4 TITLE (and Subtitle): IMPLEMENTING THE SKILL QUALIFICATION TESTING SYSTEM	5. TYPE OF REPORT & PERIOD COVERED
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Milton H. Maier, Douglas L. Young, and Stephen F. Hirshfeld	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: U.S. Army Research Institute for the Behavioral and Social Sciences PERI-II 1300 Wilson Blvd, Arlington, VA 22209	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: P.E: 6.37.31.A 2Q763731A730
11. CONTROLLING OFFICE NAME AND ADDRESS: U.S. Army Research Institute for the Behavioral and Social Sciences PERI-ZT 1300 Wilson Blvd, Arlington, VA 22209	12. REPORT DATE: April 1976
	13. NUMBER OF PAGES: 7
14. MONITORING AGENCY NAME & ADDRESS(If different from Controlling Office)	15. SECURITY CLASS. (of this report): Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Procedures for Validating Skill Qualification Tests and Manual for Developing Skill Qualification Tests were distributed by the Army Training and Doctrine Command (Fort Monroe, VA 23651), 19 November 1975 and 25 February 1976 respectively.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Performance testing
Criterion-referenced testing (CRT)
Test development procedures
Skill Qualification Tests (SQT)
SQT validation procedures
Military Occupational Specialty (MOS) tests

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This Utilization Report outlines the research conducted on Skill Qualification Tests (SQT), presents the principles involved in setting up procedures for their construction and validation, and describes current manuals distributed to the Army Test Development Activities charged with responsibility for developing operational SQTs. As Skill Qualification Tests are completed, they are scheduled to replace current paper-and-pencil Military Occupational Specialty tests, beginning January 1977.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

R&D Utilization Report 76-1

IMPLEMENTING THE SKILL QUALIFICATION TESTING SYSTEM

Milton H. Maier, Douglas L. Young,
and Stephen F. Hirshfeld

INDIVIDUAL TRAINING AND SKILL EVALUATION TECHNICAL AREA
Milton S. Katz, Chief

Submitted by:
E. Ralph Dusek, Director
INDIVIDUAL TRAINING & PERFORMANCE
RESEARCH LABORATORY

Approved By:
J. E. Uhlaner
TECHNICAL DIRECTOR

U. S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

Office, Deputy Chief of Staff for Personnel
Department of the Army
1300 Wilson Boulevard, Arlington, Virginia 22209

April 1976

Army Project Number
2Q763731A770

Performance-Based Evaluation

FOREWORD

Typically, R&D Utilization Reports discuss the effective utilization of research developed by the Army Research Institute for the Behavioral and Social Sciences (ARI) or under contract to ARI. Final reports contain a more detailed presentation of the research and are available on a limited basis.

In response to specific requirements of the Training Management Institute of the Army Training and Doctrine Command (TRADOC), Fort Eustis, Virginia and of Army Project 2Q763731A770, "Performance-Oriented Individual Skill Development," ARI has developed a system of hands-on performance testing through Skill Qualification Tests (SQT). The Human Resources Research Organization (HumRRO) developed the initial draft Performance Test Development for Skill Qualification Testing: A Manual by Robert Vineberg and Elaine N. Taylor in August 1975, based partly on projects PERFORM and ATC-PERFORM, and used this draft to conduct workshops on SQT development, under Contract DAHC 19-75-C-0016 (Dr. Theodore R. Powers, Principal Investigator). ARI is continuing development and validation of the SQT, with related programs by ARI Field Units at Fort Ord, California and Fort Knox, Kentucky.

J. E. UHLANER
Technical Director

IMPLEMENTING THE SKILL QUALIFICATION TESTING SYSTEM

INTRODUCTION

As part of the Army's efforts to upgrade its personnel programs, the Enlisted Personnel Management System (EPMS) was established in 1974 to design a career system for the individual enlisted man and provide the requisite number of men in each skill level of every Military Occupational Specialty (MOS) necessary to carry out the Army's mission. In order to accomplish this, EPMS provides training and instruction as part of a career-long process for enlisted personnel as well as a comprehensive testing program that will assess the competence of soldiers at all skill levels. Soldier's Manuals contain training and evaluation guidelines for individual MOS to address the former concern; Skill Qualification Tests (SQT) are being developed to address the latter.

Beginning in January 1977, SQTs are scheduled to gradually replace the present paper-and-pencil MOS tests. SQTs are composed of performance tests and performance-based tests of tasks at specific skill levels of an MOS. The development and validation procedures will result in standardized, job-related tests. These tests will yield reliable results; they must also be acceptable to soldiers, supervisors, and commanders as valid measures of ability; they must be suitable for administration anywhere under a variety of conditions. The Army Training and Doctrine Command (TRADOC) sponsored research on SQT development by the Army Research Institute for the Behavioral and Social Sciences (ARI). The research results were used to formulate doctrine implemented by the Test Development Activities.

SPECIFICATIONS FOR SKILL QUALIFICATION TESTS

The goal of Skill Qualification Tests is accurate identification of mastery or nonmastery of critical job tasks. To do this, SQTs sample the critical job tasks of an MOS by means of the Scoreable Unit. Each Scoreable Unit is designed to identify whether or not an individual can perform one critical task to acceptable standards under a given set of conditions. It is composed of a set of Performance Measures for tasks measured through hands-on performance tests, or a set of Items for tasks measured through performance or performance-based written tests. SQTs are composed of 35-75 Scoreable Units (Figure 1).

Performance Measures and written Items are designed to evaluate performance of crucial elements of the tasks. Each Performance Measure or Item must indicate ability on an element of the task; i.e., masters succeed, while nonmasters fail. Performance Measures or Items are grouped into Scoreable Units for which reasonable standards of task mastery can be established. An aggregate score of GO on the Scoreable Unit defines mastery, while NO-GO defines nonmastery. GO/NO-GO scores on Scoreable Units are summed to yield a total SQT score which provides

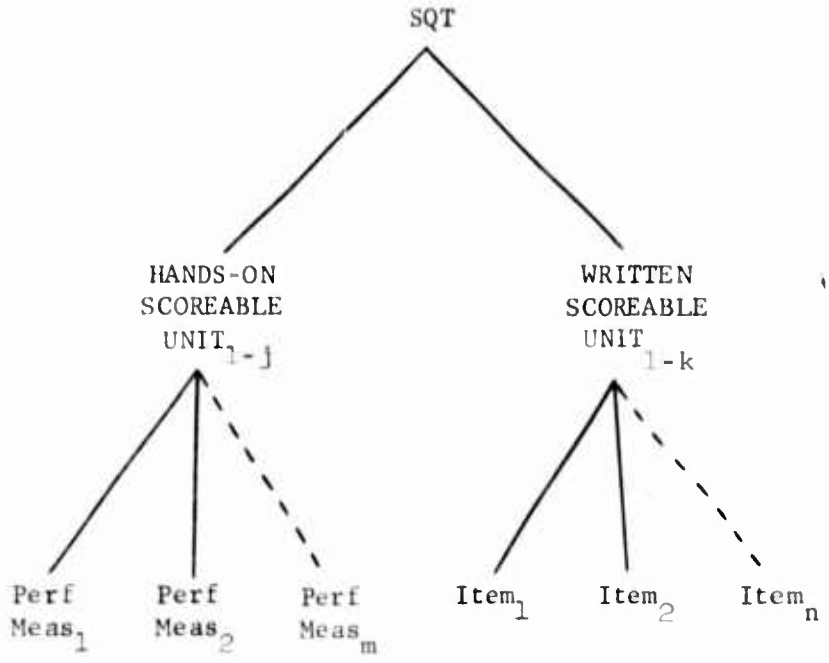


Figure 1. Diagrammatic structure of the SQT.

estimates of MOS proficiency. The focus of attention during the development of SQTs, i.e., Scoreable Unit construction and validation, is on performance and performance-based tests of tasks. Accuracy of all Scoreable Units is empirically evaluated during the iterative validation procedure. Validity against an external criterion is of less concern for criterion referenced proficiency tests than for the traditional achievement and aptitude tests because validity is more inherent in criterion-referenced development and validation procedures.

CONSTRUCTION AND VALIDATION OF SCOREABLE UNITS

Tables 1 and 2 summarize the development of SQT Scoreable Units.

Table 1

SUMMARY OF STEPS TO CONSTRUCT SCOREABLE UNITS

1. REVIEW TASK ANALYSIS

2. SELECT TASKS FOR SQT

3. CATEGORIZE TASKS
   - A. Primarily Physical Skills (go to step 4)
   - B. Primarily Mental Skills (go to step 5)

4. PHYSICAL SKILLS TASKS--DETERMINE FEASIBILITY FOR
   - A. Hands-on Component
     - YES - develop hands-on Scoreable Unit
     - NO - determine feasibility for Performance Certification Component
   - B. Performance Certification Component
     - YES - put tasks in Performance Certification Component
     - NO - develop performance-based written Scoreable Unit
   - C. Performance-Based Test For A Written Scoreable Unit

5. MENTAL SKILLS TASKS
   - A. Develop Written Scoreable Units
   - B. Consider Hands-on And Performance Certification Components For Unusually Long, Complex Tasks

Table 2

OUTLINE OF SKILL QUALIFICATION TEST SCOREABLE UNITS VALIDATION PROCEDURES

PHASE	I. HANDS-ON COMPONENT	II. WRITTEN COMPONENT
0	• Construct Scoreable Units, at least 20 percent extra	• Construct Scoreable Units, at least 20 percent extra
I	• Test Scoreable Units with experts . Identify mastery . Determine acceptability • Try out Scoreable Units on 5 novices with 4 raters . Compute rater agreement . Compute proportion pass • Determine acceptability to 5 novices and 4 raters	• Administer Scoreable Units to item writers • Try out 2 Scoreable Units against performance tests . Identify mastery . Compute Agreement Indices between items and performance test • Try out Scoreable Units on 30 examinees . Identify experts and novices with self-ratings . Compute Agreement Indices between self-ratings and Scoreable Units . Compute item-Scoreable Unit agreement • Determine acceptability to examinees • Conduct formal review with 5 Subject Matter Experts
II	• Try out Hands-on Component with representative soldiers, raters, and evaluators [a] . Compute rater agreement . Judge administrative feasibility . Determine acceptability to 10 soldiers, 4 raters, and evaluators [a] • Revise • Forward Hands-on Component with agreement and acceptability data to ITEG [b]	• Try out Scoreable Units on 20-30 representative soldiers . Compute item-Scoreable Unit agreement . Determine acceptability to soldiers and evaluators [a] • Revise • Forward Written Component with agreement and acceptability data to ITEG [b]
III	• Determine acceptability • Revise, reassemble component, and forward to ITEG [b]	• Revise Scoreable Units as requested by ITEG [b]

[a] evaluators: 10 supervisors and 5 commanders
[b] ITEG: Individual Training Evaluation Group

PRODUCTS

ARI contracted with the Human Resources Research Organization (HumRRO) to produce a manual for developing hands-on performance tests. In August 1975, however, the requirements for SQTs were changed by TRADOC to include both hands-on and written components. Procedures for the restructured SQT were presented by ARI at the EPMS Implementation Conference, August 1975. The papers were entitled Skill Qualification Test Design and Validation by Proponent Agencies and Procedures for Scoring the Skill Qualification Test.

The draft manual prepared under contract and the validation procedures prepared by ARI formed the basis of a series of four workshops presented by HumRRO for Test Development Activities during August, September, and October 1975. Concurrently, HumRRO was preparing another draft of the manual to incorporate written Scoreable Units. The revised manual was distributed by TRADOC to Test Development Activities on 25 February 1976. As part of this continuous effort papers were presented at the Military Testing Association Annual Conference in September 1975 by Drs. Hirshfeld and Young of ARI, CPT H. W. Forthouse of TRADOC, and Drs. Taylor, Vineberg, and Osborn of HumRRO.

ARI submitted Procedures for Validating Skill Qualification Tests to TRADOC in October 1975. The Training Management Institute of TRADOC distributed the validation procedures to all Test Development Activities on 19 November 1975. Meanwhile, ARI had been participating with selected Test Development Activities in the development and validation of their SQTs. This interaction led to revision of the validation procedures; the revised validation procedures were submitted to TRADOC, who distributed them to the Test Development Activities in April 1976.

UTILIZATION

The development manual and validation plan are being used in the context of the EPMS objectives to provide not only training but testing that assesses competence of soldiers at all skill levels. They are being used initially by nine Test Development Activities (Infantry, Armor, Air Defense, Ordnance, Engineer, Quartermaster, Administration, Military Police, and Signal) as these test developers construct and empirically validate Scoreable Units. The experience of this first group will lead to improved test procedures for later groups. Subsequently these procedures will be used by the 30+ Test Development Activities.

The SQT system can be generalized to civilian personnel selection, placement, and promotion actions.

REFERENCES

Vineberg, Robert, and Taylor, Elaine N. Performance test development for Skill Qualification Testing: A manual. Prepared by HumRRO, Western Division, under Contract DAHC 19-75-C-0016. August 1975.

Papers presented at EPMS Implementation Conference, August 1975, at the U.S. Training and Doctrine Command (TRADOC) Headquarters, Fort Monroe, Virginia:

Hirshfeld, S. F. Procedures for scoring the Skill Qualification Test.

Young, D. L. Skill Qualification Test design and validation by proponent agencies.

Papers presented at the Military Testing Association Annual Conference, September 1975, at Indianapolis, Indiana:

Hirshfeld, S. F., and Young, D. L. Issues in skill qualification testing.

Porthouse, H. W. The Army's adoption of performance testing for MOS proficiency.

Taylor, Elaine N., Vineberg, Robert, and Osborn, William C. Sampling and simulation tests in job performance.

Young, D. L., and Hirshfeld, S. F. Current and projected research in skill qualification testing.

Hirshfeld, S. F., Young, D. L., and Maier, M. H. Procedures for validating Skill Qualification Tests. Distributed 19 November 1975 by U.S. Army Training and Doctrine Command to all Test Development Activities and Training Centers. A revised version has been distributed in April 1976.

Vineberg, Robert, Taylor, Elaine N., Young, D. L., Hirshfeld, S. F., and Maier, M. H. Manual for developing Skill Qualification Tests. Distributed 25 February 1976 by U.S. Army Training and Doctrine Command to all Test Development Activities.